Aviation Protective Equipment Orientation
U3004526 / Version 1
02 Dec 2004

SECTION I. ADMINISTRATIVE DATA

All Courses Including This Lesson

Course Number	Version	Course Title
300-F6	2005	Flight Medic
6A-61N9D	05	Flight Surgeon Course (Primary)
6H-F27	04D	AEROMEDICAL PSYCHOLOGY TRAINING

Task(s) Taught(*) or Supported

Task Number	Task Title
	INDIVIDUAL
081-839-5315 (*)	WEAR FLIGHT SUITS/HELMET PROPERLY
081-CF9-0002 (*)	EMPLOY AVIATION PROTECTIVE EQUIPMENT

Reinforced Task(s)

Task Number	Task Title

Academic Hours

The academic hours required to teach this lesson are as follows:

	Resident Hours/Methods
	40 mins / Conference / Discussion
	10 mins / Conference/Demonstration
Test	0 hrs
Test Review	0 hrs
Total Hours:	1 hr

Test Lesson Number

	Hours	Lesson No.
Testing (to include test review)	1 hr	U3004503 version 1

Prerequisite Lesson(s)

Lesson Number	Lesson Title
None	

Clearance Access

Security Level: Unclassified
Requirements: There are no clearance or access requirements for the lesson.

Foreign Disclosure Restrictions

FD5. This product/publication has been reviewed by the product developers in coordination with the USASAM foreign disclosure authority. This product is releasable to students from all requesting foreign countries without restrictions.

References

Number	Title	Date	Additional Information
AR 670-1	Wear and Appearance of Army Uniforms and Insignia	03 Feb 2005	
AR 95-1	Flight Regulations	01 Sep 1997	
FM 1-301	(SS/FM 3-04.301, 29 SEP 00) Aeromedical Training for Flight Personnel	29 May 1987	
STANAG 3204	Aeromedical Evacuation		
TM 10-8400-201-23	General Repair Procedures for Clothing	07 May 1990	

Student Study Assignments

Study student handout and review reference materials listed above.

Instructor Requirements

One primary instructor.

Additional Support Personnel Requirements

Name	Stu Ratio	Qty	Man Hours
None			

Equipment Required for Instruction

Id Name	Stu Ratio	Instr Ratio	Spt	Qty	Exp
COMPU-PR0J OVERHEAD PROJECTOR W/ COMPUTER INTERFACE	1:50		No	0	No
COMPUTER-INSTRUCTOR COMPUTER (CPU) WITH KEYBOARD, INSTRUCTOR USE ONLY	1:50		No	0	No
MONITOR-INSTRUCTOR COMPUTER MONITOR, INSTRUCTOR USE ONLY	1:50		No	0	No
SCREEN-INSTRUCTOR SCREEN PROJECTOR, INSTRUCTOR USE	1:50		No	0	No

* Before Id indicates a TADSS

Materials Required

Instructor Materials:
Aviation Protective Equipment Orientation Lesson Plan.

Student Materials:
Aviation Protective Equipment Orientation Student Handout.

Classroom,

Training Area, and Range Requirements

Ammunition Requirements

Id	Name	Exp	Stu Ratio	Instr Ratio	Spt Qty
None					

Instructional Guidance

NOTE: Before presenting this lesson, instructors must thoroughly prepare by studying this lesson and identified reference material.

This class is also taught to the IERW for flight school.

Proponent Lesson Plan Approvals

Name	Rank	Position	Date
Campbell, John			09 Dec 2004
Schwab, Douglas			02 Dec 2004
Bost-Pittman, Carolyn			03 Dec 2004

SECTION II. INTRODUCTION

Method of Instruction: Conference / Discussion
Instructor to Student Ratio is: 1:50
Time of Instruction: 5 mins
Media: Large Group Instruction

Motivator

Use it, paraphrase it, or develop one of your own. Ensure the motivator gains the students' attention, states the need for training, and explains the terminal learning objective.

"During a night approach, a UH-60 Black Hawk struck the ground in a nose high, right side low attitude. The right 230-gallon noncrashworthy external fuel tank ruptured on impact. The responding fire rescue personnel contained the postcrash fire within two minutes of their arrival. Four personnel on board received fatal injuries, three individuals received major thermal injuries and one person received minor thermal injuries. The pilot was wearing leather boots, serviceable NOMEX flight suit, gloves, jacket (with collar up) and helmet. Although on fire when he egressed, the ensemble worked as designed and the flames extinguished. The flight jacket collar and right shoulder burned through the outer layer, but protected him from thermal injury. The stitching on his right boot burned through revealing the inner Gore Tex liner, yet protected his feet from injury. He received minor thermal injuries. The copilot egressed shortly after the pilot. He was wearing gloves with holes in numerous fingertips. As a result, the burns he received to his right hand caused permanent impairment. He also was wearing an Air Force approved flying coverall under his NOMEX flight suit. This Air Force item was not authorized by the Army for aviation use because of a nylon lining. Where both flight suit and flight jacket covered the coverall, it did not melt or burn. From the waist down, however, the heat and fire melted the coverall into the flight suit and the individual. The thermal injuries this individual received on his legs resulted in his disqualification from aviation and military duties. One passenger egressed successfully only to return to the blaze to assist another passenger. He was wearing a battle dress uniform (BDU) and a Gore Tex field jacket. The Gore Tex material did not contribute to injury, but the jacket's nylon liner and outer shell burned and melted into the fabric of BDU and his skin. He received major thermal injuries".

"This class will cover the proper wear and maintenance of aviation equipment while serving as an aircrew member. It will help reduce injuries and possibly save your life should you be involved in an aircraft accident".

Terminal Learning Objective

NOTE: Inform the students of the following Terminal Learning Objective requirements.

At the completion of this lesson, you [the student] will:

Action:	Employ aviation protective equipment.
Conditions:	While performing as an aircrew member.
Standards:	IAW AR 95-1, AR 670-1, TM 10-8400-201-23, TM 1-8415-216-12&P, and TM 1-8415-215-12&P.

Safety Requirements

None.

Risk Assessment Level

Low - RISK ASSESSMENT LEVEL: Low.

Environmental Considerations

NOTE: It is the responsibility of all soldiers and DA civilians to protect the environment from damage.
None.

Evaluation

On the last day of aviation medicine academics, each student will be evaluated on this block with a 50 question examination in which they must answer 35 of 50 questions correctly to receive a passing score. The test will be given in room X110 of Bldg 301.

Instructional Lead-In

This class is the base for which you will build upon the proper wear of aviation protective equipment. You will be able to maintain and wear this equipment IAW the appropriate Army Regulations and Technical Manuals. You will use these instructions as a self-checklist every time you wear flight equipment.

SECTION III. PRESENTATION

NOTE: Inform the students of the Enabling Learning Objective requirements.

A. ENABLING LEARNING OBJECTIVE

ACTION:	Identify the safety features provided by an aircraft.
CONDITIONS:	Given a list.
STANDARDS:	In accordance with USAARL Report No. 93-15.

1. Learning Step / Activity 1. Identify the safety features provided by an aircraft.

Method of Instruction: Conference / Discussion
Instructor to Student Ratio: 1:50
Time of Instruction: 10 mins
Media: Large Group Instruction

a. Aircraft structural shell (fuselage). The cockpit and cabin should possess sufficient strength to prevent intrusion of structure in occupied spaces during a survivable crash. The floor and nose of the aircraft should be of a design which reduces plowing or scooping of earth during crashes which could decrease stopping distances resulting in higher decelerative forces.

b. Landing gear and crashworthy seats. Newer Army rotary wing aircraft (UH-60/AH-64) rely heavily on fixed landing gear and seats to attenuate crash forces. Fatalities are rare for vertical impacts up to approximately 15.2 meters per second (50 ft/sec). Maximum landing loads for the UH-60 is 540 ft/min (11.25g) under normal conditions.

c. Personnel restraint system. To survive an impact, only to then be injured or killed due to ejection from the aircraft would be terrible. Studies indicate that contact injuries (secondary impacts) occur 5 times as often as acceleration injuries. Therefore personal restraints should be tight as to inhibit contact with objects in the cockpit, i.e. cyclic. Equipment should also be tied-down securely to prevent being thrown into crew members.

d. Post-crash factors. Army aircraft offer protection from thermal injuries several ways. Crashworthy fuel systems; self sealing fuel cells, and break free self sealing fuel lines. Fire extinguishing systems in the engine compartment and personal fire extinguishers in the cockpit (for personnel). Protection from drowning is primarily provided through training of the crewmember (water survival training), also, special equipment is required during overwater missions: personal flotation devices (water wings), and rafts.

NOTE: Conduct a check on learning and summarize the learning activity.

CHECK ON LEARNING:

B. ENABLING LEARNING OBJECTIVE

ACTION:	Identify the characteristics and wear of flight clothing.
CONDITIONS:	Given a list.
STANDARDS:	IAW AR 95-1, AR 670-1, TM 10-8400-201-23, TM 1-8415-216-12&P, and TM 1-8415-215-12&P.

1. Learning Step / Activity 1. Provide instruction on characteristics and wear of the flight clothing.

Method of Instruction: Conference/Demonstration
Instructor to Student Ratio: 1:50
Time of Instruction: 10 mins
Media: Large Group Instruction

NOTES: AR 95-1 states: "The following U.S. Army approved clothing and equipment will be worn by all crew members when performing crew duties: leather boots, flight helmet, flight suit, flight gloves, cotton, wool, or NOMEX underwear, and identification tags".

Case Report. During a rapid (hot) refueling operation, the refueling nozzle quick disconnect fitting failed, spraying fuel onto an operating AH-64 Apache engine. The aircraft immediately was engulfed in flames. The pilot and copilot both received major thermal injuries. The total time from initial fuel combustion to both pilots' egress was 18 seconds. The copilot egressed immediately and received second degree burns to 21% of his body and third degree burns to 3% of his body. He wore appropriate flight outer garments, but he did not wear underwear. Consequently, most of his severe thermal injuries were to his buttocks.

Proper wear of all aviation life support equipment must be established before the flight begins. If an emergency occurs the crew member may either be too busy or have insufficient time to make corrective changes (especially if the aircraft is at a low altitude as in nap-of-the-earth flight).

a. A functional aviation protective equipment ensemble is determined not only by proper care and maintenance techniques, but also by proper wear of the equipment.

b. Under-garments. Wear cotton, wool or NOMEX underwear when performing crew duties per AR 95-1.

WARNINGS: Nylon or other synthetic underwear will melt underneath the NOMEX, and cause life threatening burns to the trunk and groin. Most synthetic underwear fabrics melt at or below 350^{o} and ignite at 450^{o} and above.

NOMEX is not fireproof and will char at about 700^{o} to 800^{o}

F (370^{o} to 430^{o} C); therefore, ground egress procedures

cannot be over emphasized.

Improper use of these garments can produce heat exhaustion within thirty minutes of hard work.

c. NOMEX flight suits (either the one piece, sage green or the Aviation Battle Dress Uniform) are flame resistant garments. The flame resistant properties are inherent of the polymer chemistry, it will not diminish during the life of the fiber. This flexible polymer chain gives NOMEX more textile-like qualities while retaining high temperature properties similar to KEVLAR.

(1) Characteristics.

(a) Does not support combustion but chars at approximately 700^{o}-800^{o} F (370^{o} to 430^{o} C).

(b) Does not melt or drip.

(c) Good chemical resistance.

(d) NOMEX is more durable than cotton and resists abrasion.

(e) Low fiber shrinkage.

(f) Low thermal conduction.

(g) Comfortable to wear.

(2) Wear.

(a) Collar is one piece which is worn up while flying

CAUTION: Burns to the neck can occur during a flash fire if the collar is not worn up.

(b) Sleeves must be worn down and Velcro tabs secured during flight.

CAUTION: Sleeves must be long enough to compensate for reach. The wrist must remain covered even when the arm is extended, to avoid injury from flash fires or flames.

(c) Uniform should be loose fitting to prevent thermal burns due to tightness. Size and fit should completely cover all skin not covered by gloves, helmet and boots. Best protection is provided by two layers of clothing (NOMEX over NOMEX, cotton, or wool).

CAUTION: Pant legs should not rise above top of boot when sitting, to avoid injury from flash fires or flames.

d. Identification tags.

(1) Required when flying.

(2) Avoid plastic covers/liners which could cause burns if the plastic melts.

(3) ID tag chain should be worn around outside of collar and tucked between blouse and T-shirt.

e. Boots.

(1) Characteristics.

(a) Retention during high G-forces to include crash or ejection.

(b) Stability to prevent ankle and foot injury which could compromise aircraft escape.

(c) Fire retardancy of leather boots is greater than jungle boots.

(2) Boot wear.

(a) The boots must be laced up fully to the top.

(b) Avoid boots with zippers, straps, and jungle boots. Zippers will transfer heat, straps will give or even break and jungle boots will melt.

NOTE: Case report. An OH-6 with a non crashworthy fuel system crashed and burned. The pilot's thermal injuries resulted from wearing unauthorized boots with nylon uppers. The radiant heat shrunk the nylon boot causing Achilles tendon damage. The pilot was medically retired.

f. NOMEX flight gloves. Flight gloves are designed for comfort, insulation during a fire, and sensitivity to identify an object by touch.

(1) Flight Gloves must be worn at all times during flight or when engaged in flight activities.

(2) Gloves are to be worn under the sleeves of the NOMEX flight suit. If a watch is worn, it should be worn outside of glove.

g. Flight helmets.

WARNINGS: When donning the helmet, ensure that the nape strap pad is completely pulled down and that the keeper tab is taut. Failure to do so will decrease helmet stability and may cause injury to the wearer.

Always wear the helmet with the chinstrap properly attached and adjusted. Failure to secure the chinstrap will decrease helmet stability and may cause injury to the wearer.

Laser-protective visors are not intended to protect against broad-spectrum bright light. Do not use the laser-protective visors to view solar eclipses, electric welding equipment, or other potentially eye-damaging light sources.

Proper fitting is essential to the effectiveness of the helmet, all of its modules, and consequently, the safety of the operator/wearer.

CAUTIONS: Do not store helmet in a closed cockpit, an automobile, or any other area where temperatures can exceed 200^{o} on an

85^{o} day. Excessive heat will damage the thermoplastic liner (TPL).

When donning or removing helmet, spread helmet just enough to clear head. Excessive spreading may damage helmet.

(1) Sound Protective Helmet-4B (SPH4B).

(a) Characteristics.

1. Provides both crash protection and noise attenuation.

2. Superior to all preceding helmets.

3. Custom fit by local aviation life support equipment (ALSE) technician by heating or removing thermal plastic liners (TPL).

4. Dual visor provides eye and face protection day or night.

5. Designed to provide better retention if the chin strap and nape strap are tight.

(b) Wear.

1. Use visor except during night vision goggle flights or when using target acquisition equipment.

NOTE: Per USAARL Report No. 98-16, visors are available and the majority of crew members state they are satisfied with them, and using them. Still visors were found in the up position in the majority of helmets retrieved.

2. Always ensure both chin and nape straps are tight prior to flight.

NOTE: Case report. In a multi-aircraft, fast rope

insertion/extraction mission for three UH-60s, two of the aircraft had a mid-air collision. Both aircraft were totally destroyed killing 6 and injuring 39 personnel. The crew chief of one of the aircraft was wearing an HGU-56/P helmet and using his tinted visor. His most severe injury was a ruptured spleen, but he sustained blows to the head that scratched his helmet. He did have contusions to the left eye orbit. It was determined the visor reduced the severity of the injury to his face, even though he was found not to be wearing the nape strap of his helmet properly.

(2) Head Gear Unit-56P (HGU-56P). Replacement for the SPH-4B.

(a) Characteristics.

1. Constructed of graphite and SPECTRA®, a thicker less dense, energy absorbing liner. This helmet provides greater impact protection than previous helmets. Also has an upgraded retention system.

2. Sound attenuation better than SPH-4B.

3. Custom fitted by an ALSE technician.

4. Dual visors, comparable to the SPH-4B, and detachable face guard.

5. Chin and nape pad/strap for better retention. Always ensure both are tight prior to flight.

6. Platform of the future for all aviation headgear.

(b) Wear the HGU-56P the same as the SPH-4B.

NOTE: Conduct a check on learning and summerize the learning/step activity.

CHECK ON LEARNING: Conduct a check on learning and summarize the learning/step activity.

C. ENABLING LEARNING OBJECTIVE

ACTION:	Identify the maintenance procedures for flight clothing.
CONDITIONS:	Given a list.

STANDARDS:	IAW TM 10-8400-201-23 and TM 1-8415-216-12&P, and TM 1-8415-215-12&P.

1. Learning Step / Activity 1. Provide instruction on the maintenance procedures of flight clothing.

Method of Instruction: Conference / Discussion
Instructor to Student Ratio: 1:50
Time of Instruction: 10 mins
Media: Large Group Instruction

a. Avoid wearing flight suit during routine ground duties due to possible contact with grease, oil, paint, glue, and other combustible materials.

(1) Reduces fire retardancy.

(2) Reduces breathing qualities of the garment.

b. Cleaning.

(1) Wash at temperatures less than 180^{o}, and rinse completely to remove soap film.

(2) Fabric softeners may be used in the rinse cycle to remove body oils. The fabric softeners will also serve to inhibit static generation.

(3) Do not use any type of bleaching compound in laundering

(4) Do not starch. In the event that the uniform is inadvertently starched, restore the fire resistance to its original state by rinsing the garment in warm water.

(5) Drying temperature should not exceed 180^{o}.

(6) Ironing on the Permanent Press setting, medium temperature, can be done, but do not iron the Velcro tabs. Wrinkles, however, are hard to remove from NOMEX due to its high temperature resistant quality.

(7) Commercial dry cleaning may be used.

(8) The jackets and hood should be commercially dry cleaned only.

c. NOMEX flight gloves can be washed with mild soap and water while gloves are on your hands, or in a washer.

NOTE: Wash only when necessary.

(1) Washing temperature should not exceed 120^{o}. Do not bleach or starch.

(2) Remove excess water by squeezing gloves or rolling them in towel. Do not wring or twist. Stretch gloves into shape and hang or lay flat to air dry. Do not tumble dry, or expose wet gloves to heat or direct sunlight.

NOTE: It is the crew members responsibility to directly exchange (DX) these items when material is worn, ripped, or damaged.

d. SPH-4B and HGU-56P.

(1) Clean outer helmet and visors with warm soapy water and soft cloth. Remove the TPL to clean the liner.

(2) Modifications may be made only by ALSE technicians.

(3) Inspect helmet, each time it is used, for loose or worn parts, frayed straps, and cracking of the outer shell.

(4) Do not sit on helmet.

(5) Do not place objects in the helmet which can damage the protective qualities of polystyrene lining and TPL.

NOTE: Conduct a check on learning and summarize the learning activity.

CHECK ON LEARNING: Conduct a check on learning and summarize the ELO.

D. ENABLING LEARNING OBJECTIVE

ACTION:	Identify the miscellaneous apparel that is safe and unsafe.
CONDITIONS:	Given a list.
STANDARDS:	IAW AR 95-1 and AR 670-1.

1. Learning Step / Activity 1. Provide instruction on miscellaneous apparel that is safe and unsafe.

Method of Instruction: Conference / Discussion
Instructor to Student Ratio: 1:50
Time of Instruction: 10 mins
Media: Large Group Instruction

a. Metal jewelry and watches can be dangerous when working on the aircraft, near battery terminals, or exposed wiring connection.

NOTE: If you wear a watch, wear it over the gloved hand.

b. Metal insignia can contribute to injuries during a crash sequence or due to electrical short circuits. Foreign objects damage can be caused by the fastener on back of the insignia. Insignia and badges on ABDUs will be sewn on.

c. Issued sun glasses are for use during the day when night flight is anticipated. Glasses are not a substitute for visors.

WARNING: Use of sun glasses does not substitute for visor during flight.

NOTE: Conduct a check on learning and summarize the learning activity.

CHECK ON LEARNING: Conduct a check on learning and summarize the ELO.

SECTION IV. SUMMARY

Method of Instruction: Conference / Discussion
Instructor to Student Ratio is: 1:50
Time of Instruction: 5 mins
Media: Large Group Instruction

Check on Learning

a. Solicit student questions and explanations.

b. Questions and answers.

QUESTION: What are some of the safety features provided by Army aircraft?

ANSWER: Structural shell, crashworthy seats, and personnel restraint system.

QUESTION: What type of boots are to be worn while performing Flight duties?

ANSWER: All leather boots.

QUESTION: At what temperature should flight gloves be washed?

ANSWER: Temperatures less than 120^{O}.

QUESTION: Select the apparel that is unsafe to wear

ANSWER: Metal pin-on insignia

c. Correct any misunderstandings.

3. TRANSITION TO THE NEXT LESSON. This lesson is the second in your course of instruction of aviation medicine. You should now be prepared for the Aviation Protective Equipment portion of the one hour exam.

BREAK

Review / Summarize Lesson

REVIEW/SUMMARIZE.

SECTION V. STUDENT EVALUATION

Testing Requirements

NOTE: Describe how the student must demonstrate accomplishment of the TLO. Refer student to the Student Evaluation Plan.

a. Accomplishment of the TLO will be measured during the one hour exam.

b. Students must answer 35 of 50 questions correctly to receive a passing score.

Feedback Requirements

NOTE: Feedback is essential to effective learning. Schedule and provide feedback on the evaluation and any information to help answer students' questions about the test. Provide remedial training as needed.

a. Each student will be informed of his/her score immediately after the examination is graded.

b. Students who do not pass this examination will receive retraining on Aviation Protective Equipment (APE) and retest.

Appendix A - Viewgraph Masters (N/A)

Appendix B - Test(s) and Test Solution(s) (N/A)

Appendix C - Practical Exercises and Solutions (N/A)

Appendix D - Student Handouts (N/A)